Planar Defects in Colloidal Crystals and their Prospective Applications

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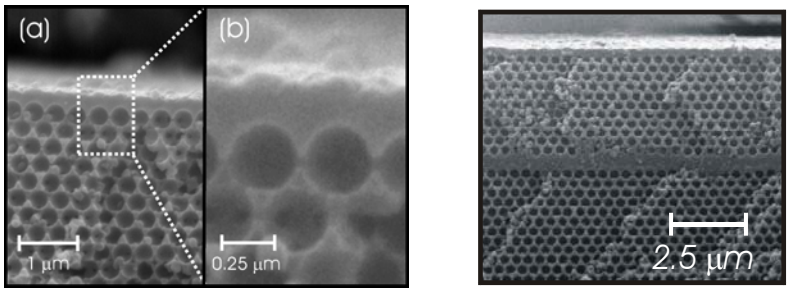
A combination of planarization, infiltration and coating techniques can be employed to create different types of planar defects in a colloidal photonic crystal. The effect of the presence of a dielectric slab of controlled thickness within the bulk of the material causes the appearance of allowed states at pseudogap frequencies, at which photon speed is slowed down.[1] Similar effects are observed when a dielectric slab is deposited on top of the crystal, the effect of surface resonant modes being observed in this case.[2] Different methods to attain these extrinsic structures from different types of materials, along with an experimental and theoretical description of the optical properties of both types of structures, will be presented.

Some recent attempts to make use of both intrinsic and extrinsic colloidal photonic crystal in optical sensor and photovoltaic prototypes will be described.[3] An enhancement of the different optical processes on which these devices rely on can be attained as a result of the presence of a colloidal crystal. Provided their processing technology could be extended to mass-scale fabrication, interesting prospective



Scanning electron microscopy images of cross sections of planarized inverse colloidal crystal thin films made of silica having a slab deposited on top (left) and embedded within the bulk of the material (right).

applications for these photonic crystals can be foreseen.

[1] N. Tetreault et al. *Advanced Materials* **16**, 346 (2004).
[2] A. Mihi et al., *Physical Review B* **71**, 125131 (2005).
[3] N. Tetreault et al., *Advanced Materials, in press*.